CLAIMS

What is claimed is:

1.   A moving picture reproducing device for reproducing an inputted data stream of moving picture data comprised of a plurality of frames, decoding each frame of the moving picture data and synchronously outputting the decoded moving picture data based on time information of the frames, comprising:

a time information interpolation processing unit to count a number of frames from a first frame up to a second frame, and to interpolate time information for a key frame based on time information of the first frame and the counted number of frames; and

a decoding unit to decode and output moving picture data based on the interpolated time information of the key frame,

wherein the first frame appears toward a positive direction of a time axis from a predetermined intermediate seek position in the data stream, and

the second frame appears after the key frame, with the key frame not having time information and appearing toward the positive direction of the time axis from the intermediate seek position.

2.   The moving picture reproducing device according to claim 1,

wherein the key frame is a frame for which the normal decoding process is executed without reference to other frames.

3.   The moving picture reproducing device according to claim 1,

wherein the time information interpolation processing unit interpolates the time information of the key frame based on the time information of the first frame, the counted number of frames, and interval time between frames.

4.   The moving picture reproducing device according to claim 1, further comprising:

a regular reproduction processing unit; and

a decoder engine unit,

wherein said regular reproduction processing unit executes a regular reproduction process to sequentially decode frames from a header frame of the data stream by calling the decoder engine unit.

5.   The moving picture reproducing device according to claim 4,

wherein the regular reproducing process does not perform the interpolation of the time information.

6.   The moving picture reproducing device according to claim 1, further comprising:

a special reproduction processing unit;

a key frame retrieving/one-frame decoding unit; and

a decoder engine unit,

wherein the special reproduction processing unit calls the key frame retrieving/one-frame decoding unit, the decoder engine unit and the time information interpolation processing unit and executes the decode process only of one frame for the key frame while executing the interpolation of the time information for the key frame.

7.   The moving picture reproducing device according to claim 6,

wherein the key frame retrieving/one-frame decoding unit analyzes the data stream and retrieves the key frame by retrieving only picture type information of a frame toward the positive direction of time axis from the intermediate seek position, and

wherein the key frame retrieving/one-frame decoding unit skips up to a frame of picture type required for the interpolation of the time information without executing the decoding process and counts up a number of frames skipped from the intermediate seek position.

8.   The moving picture reproducing device according to claim 7,

wherein the key frame retrieving/one-frame decoding unit performs the decoding process only of one frame for the retrieved key frame by calling the decoder engine unit.

9.   The moving picture reproducing device according to claim 1,

wherein the moving picture data is MPEG moving picture data, the key frame is an I-picture frame and the time information is a PTS code.

10.   The moving picture reproducing device according to claim 9,

wherein, when the first frame is an I picture frame, the time information interpolation processing unit does not perform the interpolation of the time information for the key frame.

11.   The moving picture reproducing device according to claim 9,

wherein the first frame is a B picture frame and the second frame is an I picture frame or a P picture frame.

12.   The moving picture reproducing device according to claim 9,

wherein, when the first frame is a P picture frame, the second frame is an I picture frame or a P picture frame, and the time information interpolation processing unit counts up a first number of frames from the first frame up to the I picture frame or P picture frame, counts up a second number of frames from the first frame up to an I picture frame or P picture frame appearing after the first frame, and interpolates the time information to the key frame based on the time information of the first frame, the counted first number of frames, and the counted second number of frames.

13.   The moving picture reproducing device according to claim 9,

wherein, when the first frame is a P picture frame and at least one P picture frame exists between the first frame and the key frame, the second frame is an I picture frame or a P picture frame, and the time information interpolation processing unit counts up a first number of frames from the first frame up to the I picture frame or P picture frame, counts up a second number of frames from the first frame up to a P picture frame appearing next, and interpolates the time information for the key frame based on the time information of the first frame, the counted first number of frames, and the counted second number of frames.

14.   The moving picture reproducing device according to claim 9,

wherein, when the first frame is a P picture frame and no P picture frame exists between the first frame and the key frame, the time information interpolation processing unit counts up a first number of frames from the first frame up to a I picture frame or P picture frame appearing after the key frame, counts up a second number of frames from the first frame up to the key frame, and interpolates the time information to the key frame based on the time information of the first frame, the counted first number of first frames, and the counted second number of frames.

15. The moving picture reproducing device according to claim 1, further comprising:

a skip reproduction processing unit to define a position isolated by a predetermined skip interval designated with skip interval information from a present decoding position as the intermediate seek position, retrieves the key frame, interpolates the time information of the retrieved key frame, and performs skip reproduction process to selectively output the key frame.

16. The moving picture reproduction device according to claim 15,

wherein the skip reproduction processing unit repeatedly performs the skip reproduction process while sequentially changing the intermediate seek position based on skip number information to designate a number of skip which indicates a number of times of repetition of the skip reproduction process.

17. The moving picture reproducing device according to claim 16,

wherein, when the skip reproduction process is a process in which the reproduction is started from a predetermined intermediate seek position in the data stream and continuous frames of moving picture data are sequentially decoded after the predetermined intermediate seek position, the present decoding position is a header position of the data stream, the skip interval is an interval from the header position of the data stream up to the predetermined intermediate seek position and the skip number is one.

18. The moving picture reproducing device according to claim 16,

wherein, when the skip reproduction process is a frame fast-forward reproduction process, the present decoding position is a present key frame, the skip interval is a positive offset, and the skip reproduction processing unit repeats a plurality of times a process of defining a position isolated by the positive offset from a position of the present key frame as the intermediate seek position, retrieving the key frame and interpolating the time information to the retrieved key frame and thereby selectively and sequentially output only the key frame.

19.   The moving picture reproducing device according to claim 16, wherein, when the skip reproduction process is a rewind reproduction process, the present decoding position is a present key frame and the skip interval is a negative offset, and the skip reproduction processing unit repeats a plurality of times a process of defining a position isolated by the negative offset from a position of the present key frame as the intermediate seek position, retrieving the key frame and interpolating the time information to the retrieved key frame and selectively and sequentially outputs only the key frame.

20.   A moving picture reproducing method for reproducing an inputted data stream of moving picture data comprised of a plurality of frames, decoding each frame of the moving picture data and synchronously outputting the decoded moving picture data based on time information given to each frame, comprising:

time information interpolating by counting up a number of frames from a first frame up to a second frame, the first frame having time information and appearing toward a positive direction of a time axis from a predetermined intermediate seek position in the data stream, with the second frame not having time information and appearing after a key frame, the key frame appearing toward the positive direction of the time axis from the intermediate seek position, and interpolating the time information for the key frame based on the time information of the first frame and the counted number of frames.

21.   A computer program controlling a computer to execute a moving picture reproduction operation for an inputted data stream of moving picture data comprised of a plurality of frames, decoding each frame of the moving picture data and synchronously outputting the decoded moving picture data based on time information given to each frame, the moving picture reproduction process comprising:

time information interpolating by counting up a number of frames from a first frame up to a second frame, the first frame having time information and appearing first toward a positive direction of a time axis from a predetermined intermediate seek position in the data stream, with the second frame not having time information and appearing after a key frame, the key frame appearing toward the positive direction of the time axis from the intermediate seek position, and interpolating the time information for the key frame based on the time information of the first frame and the counted number of frames.

22.   A reproducing device for a data stream, comprising:

an interpolation processing unit to interpolate a predetermined time information for a key frame, of the data stream, based on time information of a reference frame, of the data stream and different from the key frame, and a counted number of frames between the reference frame and another frame of the data stream; and

a decoding processing unit to output decoded video frames of the data stream, for an intermediate seek position of the data stream, based on the interpolated time information for the key frame.

23.   The reproducing device of claim 22, wherein the key frame is an I picture frame first appearing toward a positive direction of the time axis from the intermediate seek position

24.   The reproducing device of claim 22, wherein the reference frame is a P picture frame.

25.   The reproducing device of claim 22, wherein the reference frame is a B picture frame.

26.   The reproducing device of claim 22, wherein the time information is PTS code information.

27.   A medium comprising computer readable code controlling a computer to control the execution of the method of claim 20.

28.   A medium comprising computer readable code controlling a computer to control the operation of the apparatus of claim 1.

29.   A medium comprising computer readable code controlling a computer to control the operation of the apparatus of claim 22.

30.   A medium comprising the computer program of claim 21.